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PATENT & TRADEMARK OFFICE

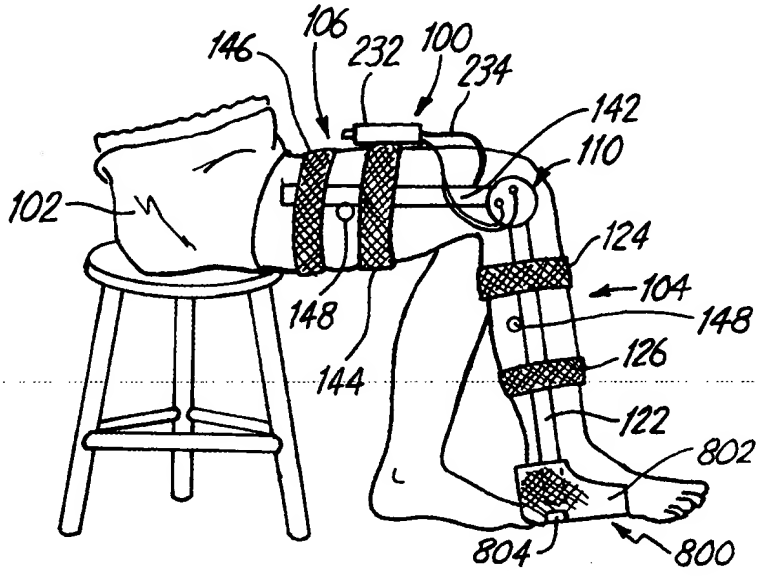


FIG. 1

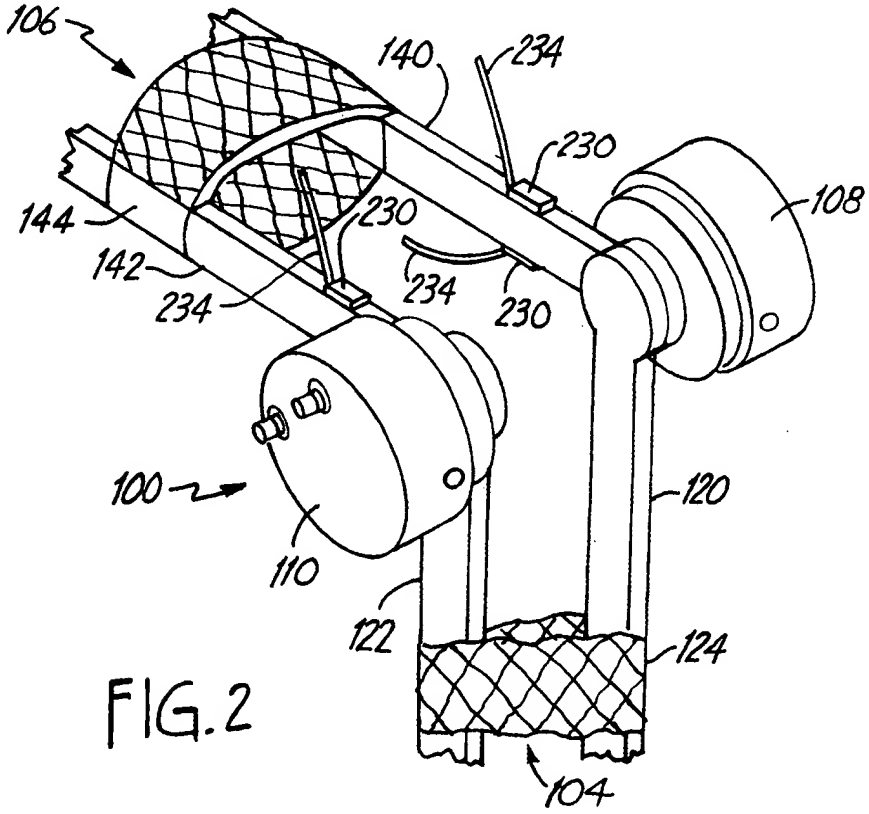


FIG. 2

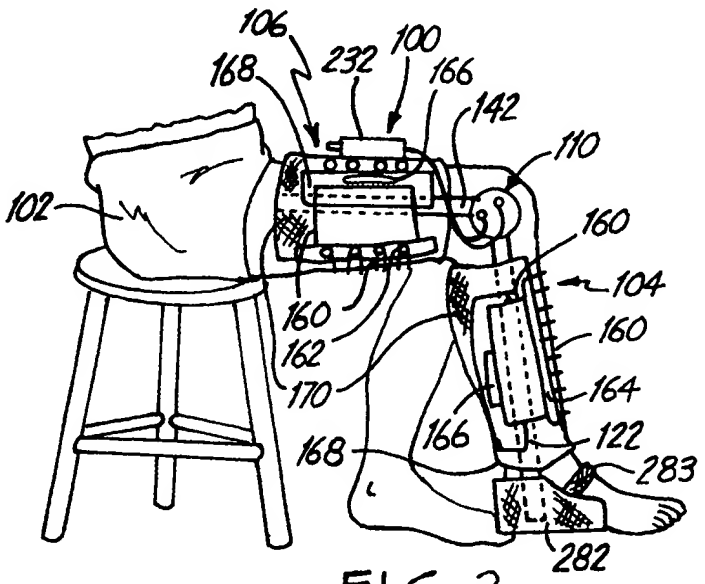


FIG. 3

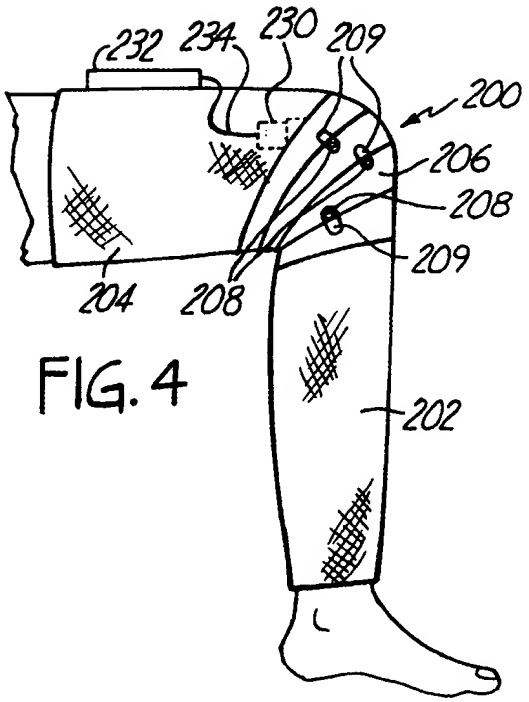


FIG. 4

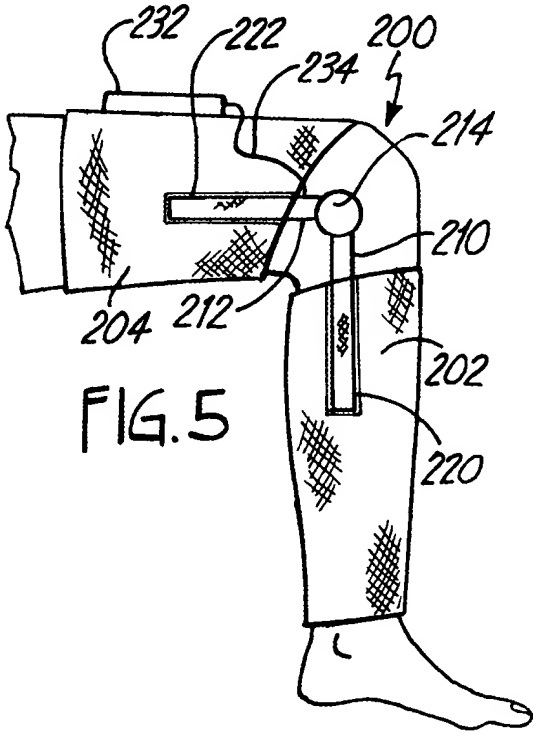


FIG. 5

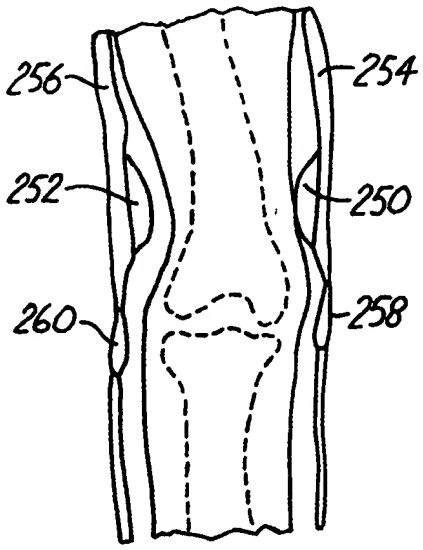


FIG. 6

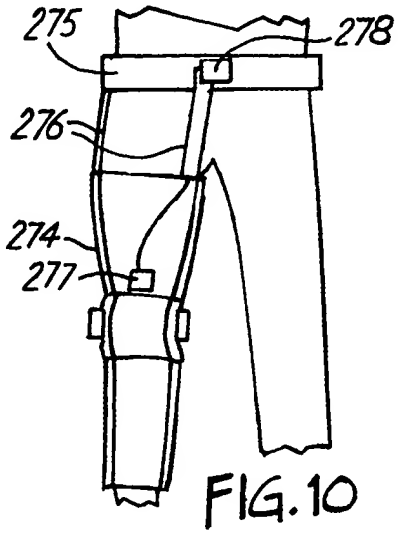


FIG. 10

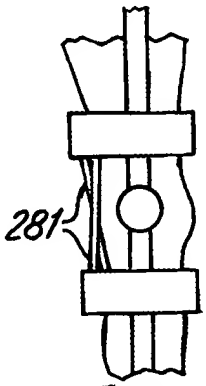


FIG. 12

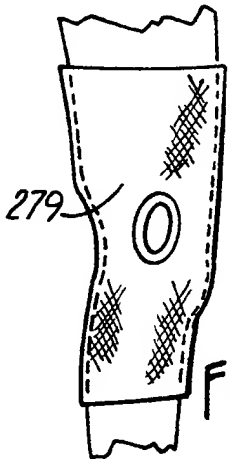


FIG. 11A

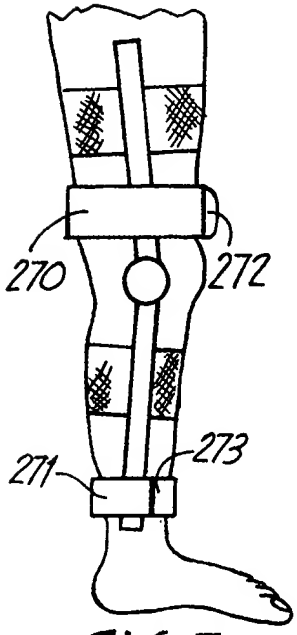


FIG. 7

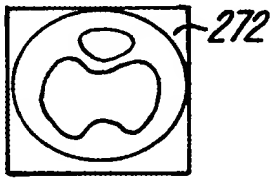


FIG. 8

FIG. 9

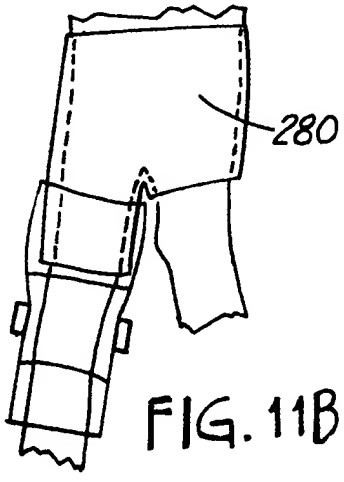
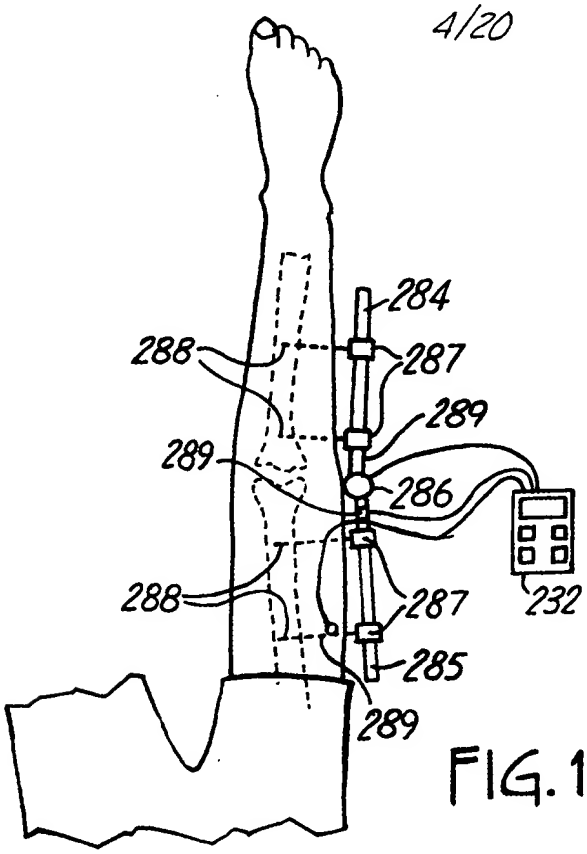


FIG. 11B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232
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FIG. 13

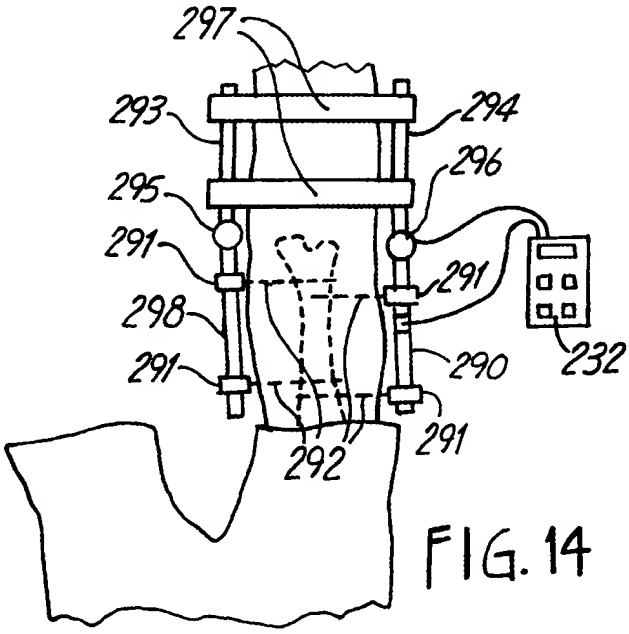
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FIG. 14

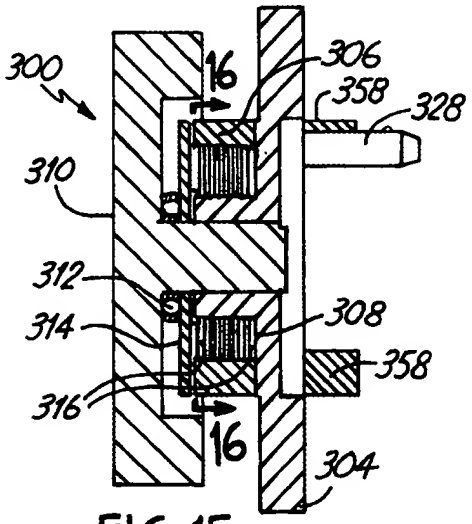


FIG. 15

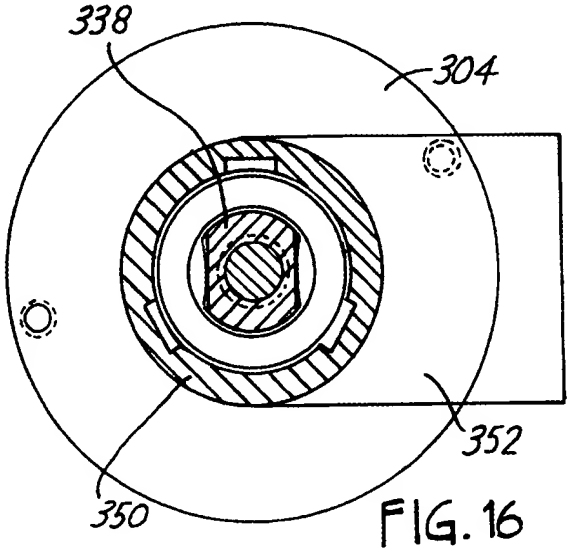


FIG. 16

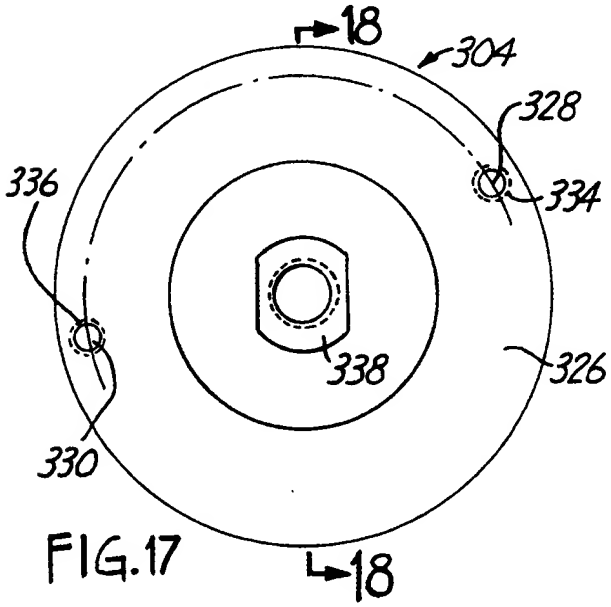


FIG. 17

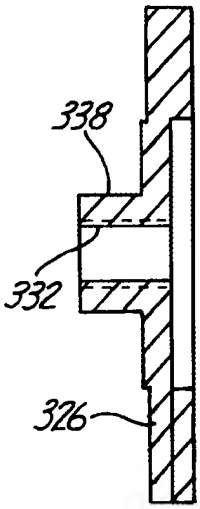


FIG. 18

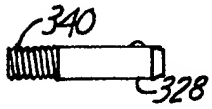


FIG. 19

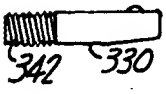


FIG. 20

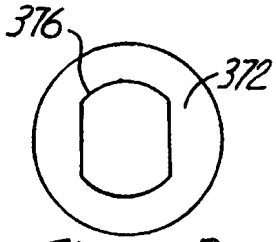


FIG. 24B

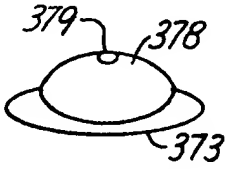


FIG. 25

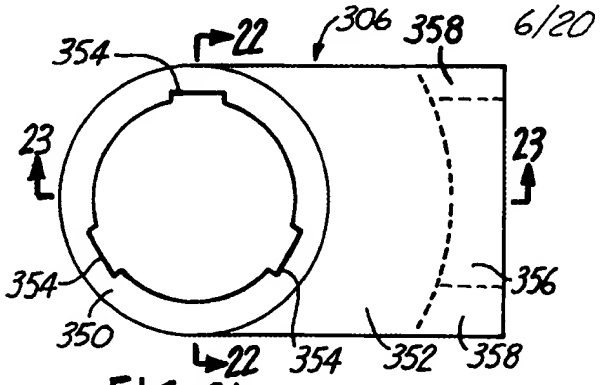


FIG. 21

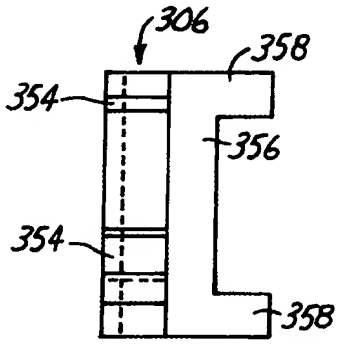


FIG. 22

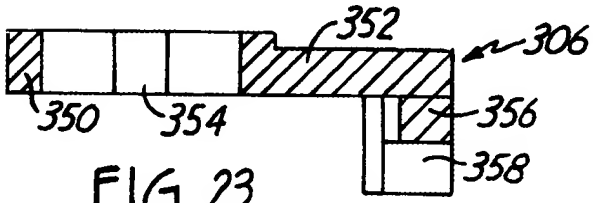


FIG. 23

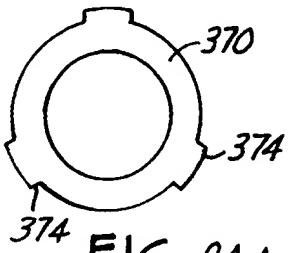


FIG. 24A

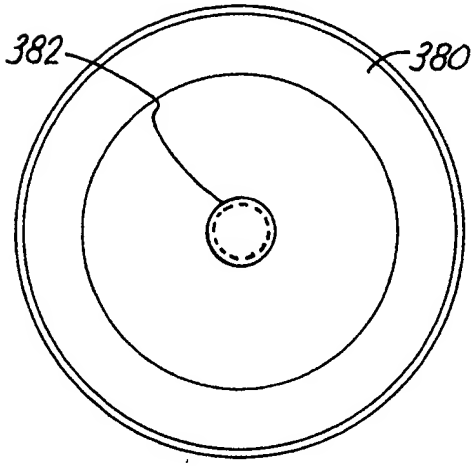


FIG. 26

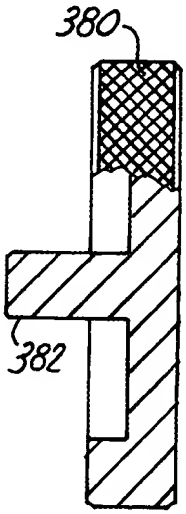


FIG. 27

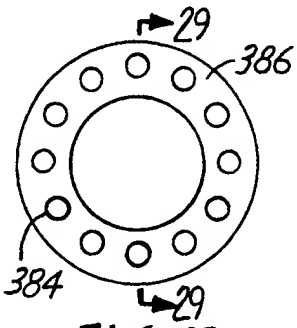


FIG. 28

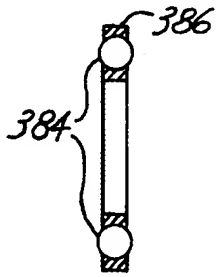
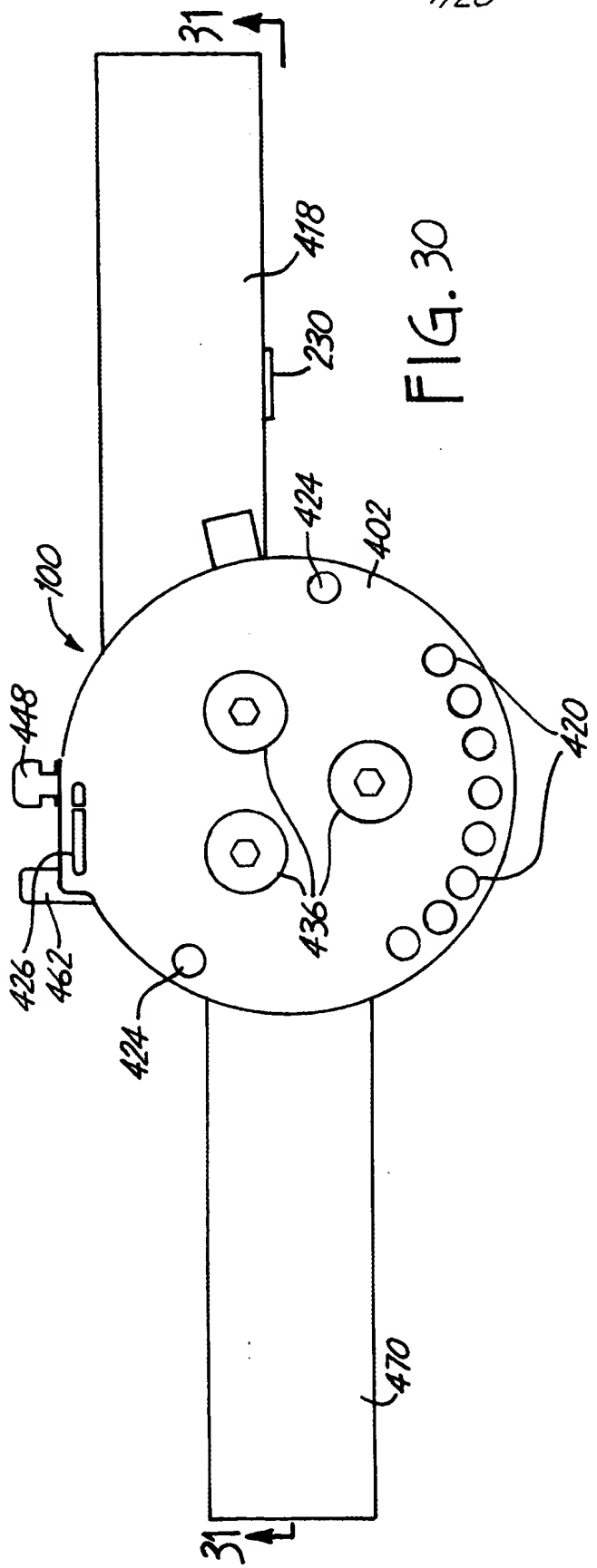


FIG. 29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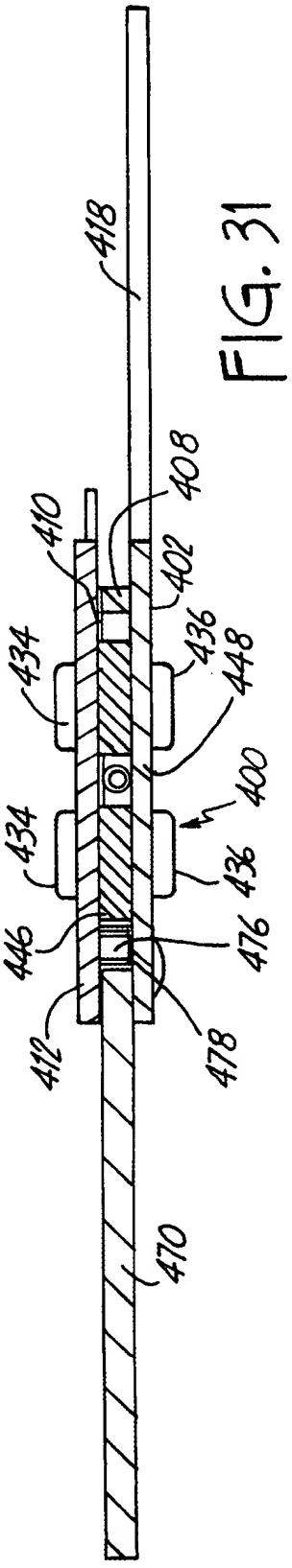
448
420
436
426
462
424
470
31

FIG. 30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410
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436
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476
412
478
470

FIG. 31

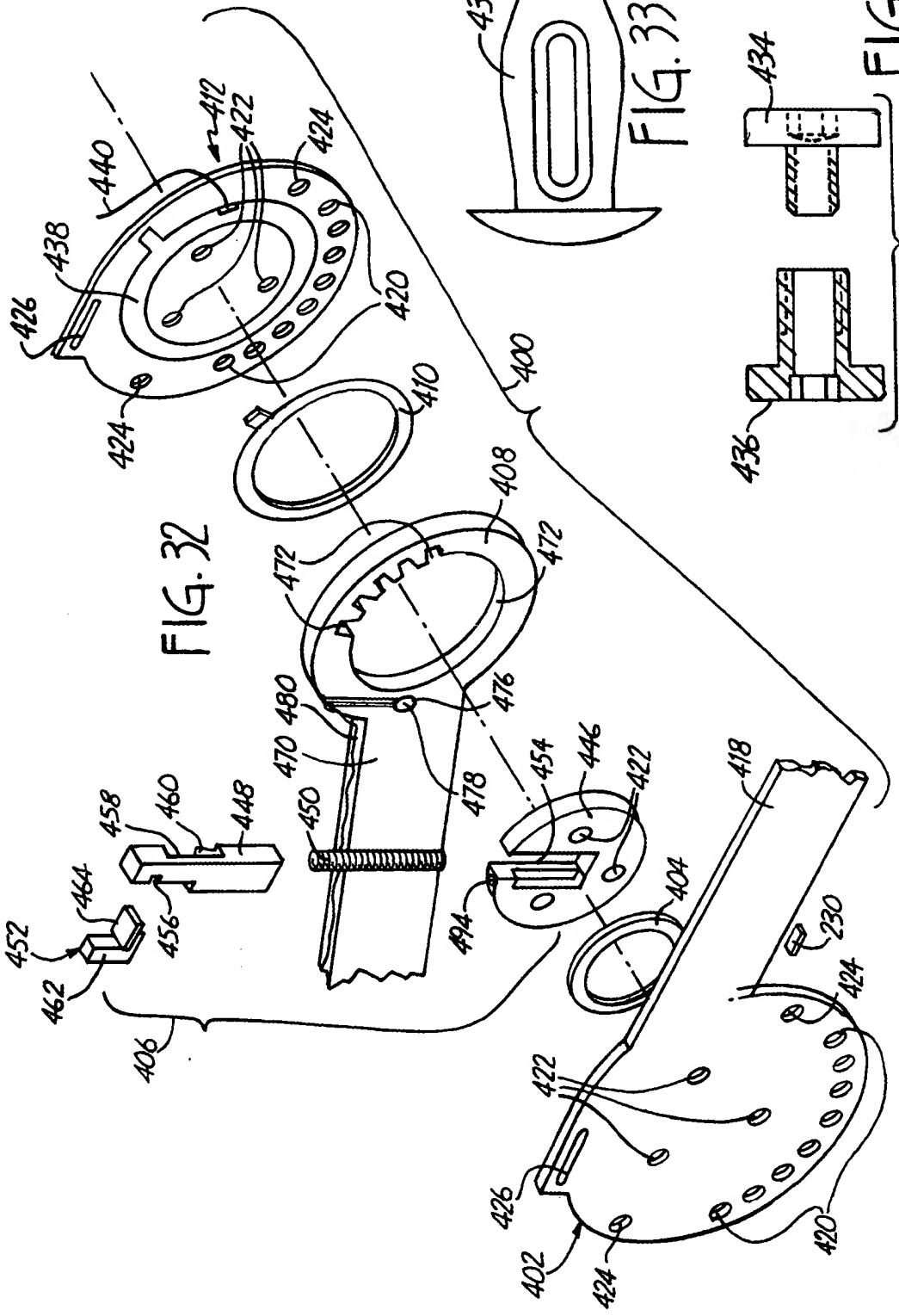


FIG. 32

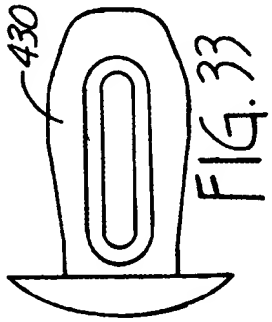


FIG. 33

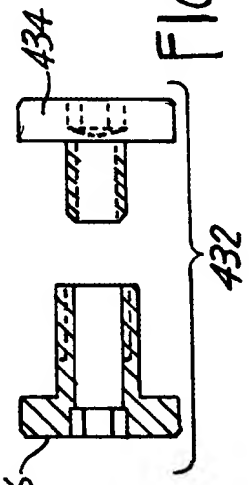


FIG. 34

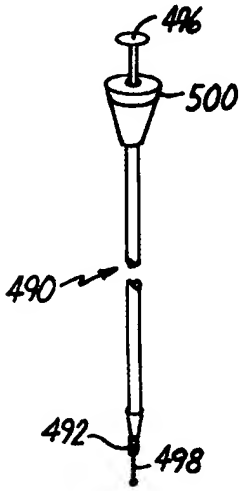


FIG. 35

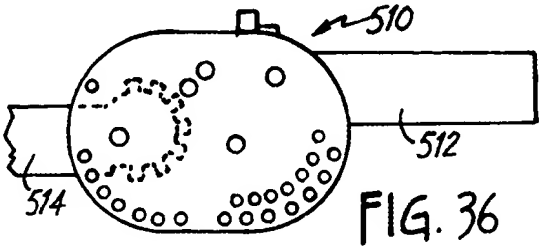


FIG. 36

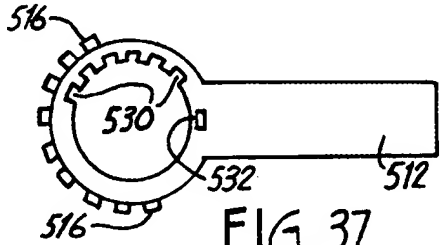


FIG. 37

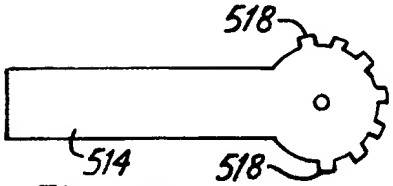


FIG. 38

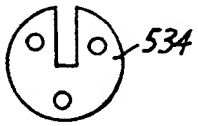


FIG. 39

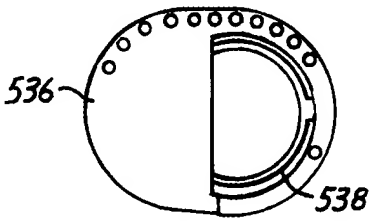


FIG. 40

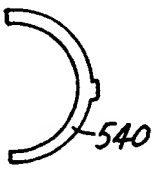


FIG. 41

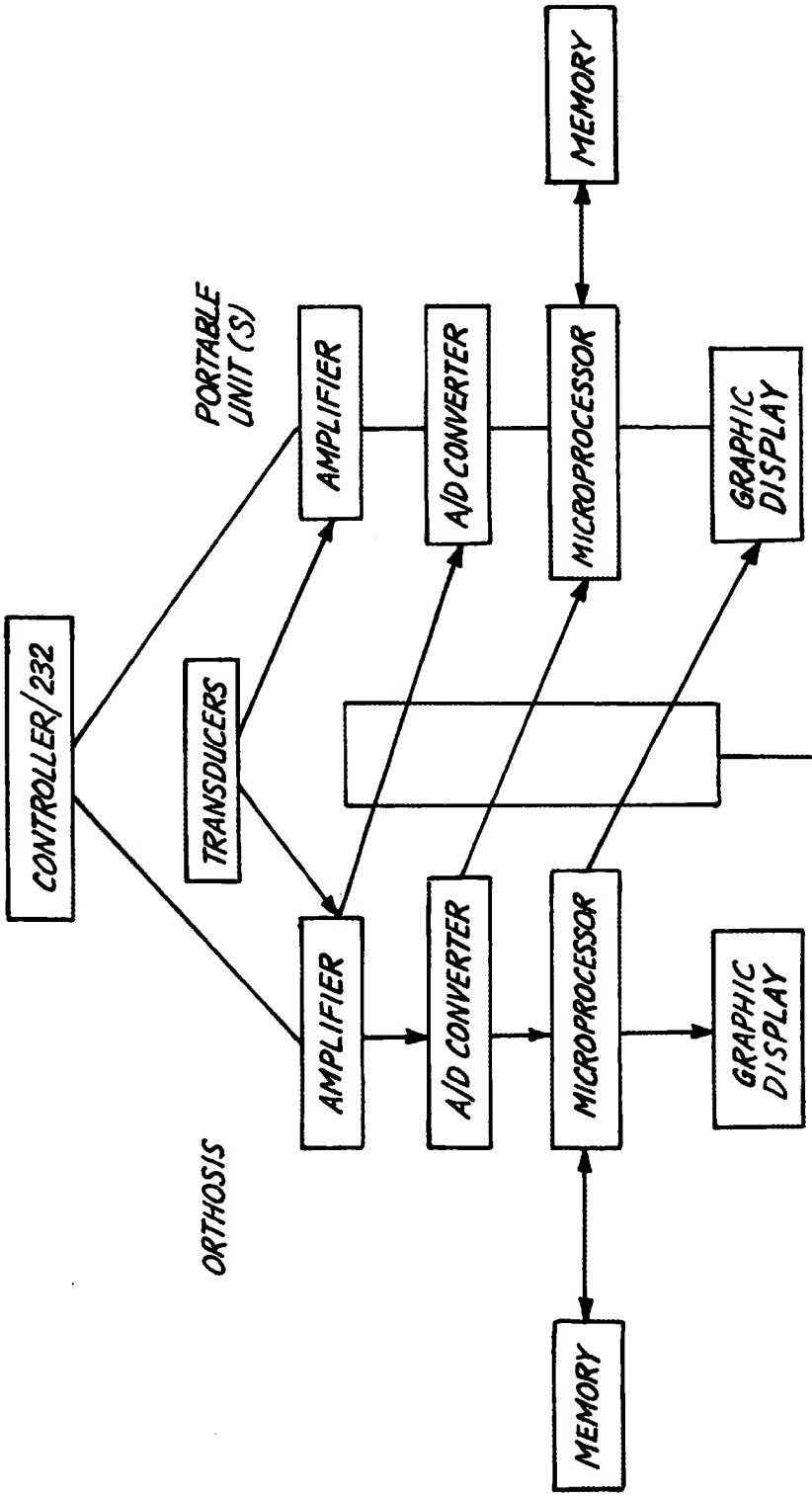

CONTROLLER/232
TRANSDUCERS
PORTABLE UNIT (S)
AMPLIFIER
A/D CONVERTER
MICROPROCESSOR
MEMORY
GRAPHIC DISPLAY
HARD WIRE CONNECTIONS OR TELEMETRY
ORTHOSIS
AMPLIFIER
A/D CONVERTER
MICROPROCESSOR
GRAPHIC DISPLAY
MEMORY

FIG. 42

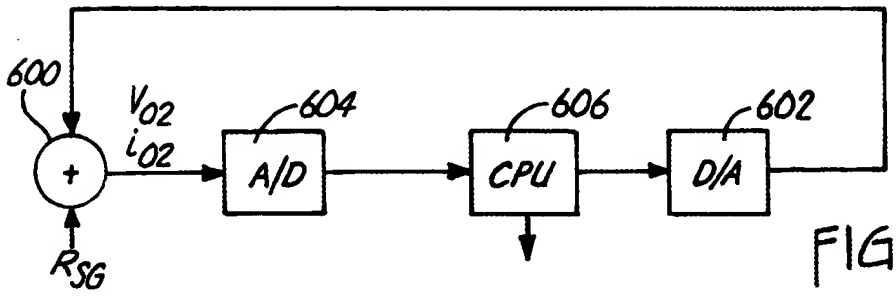

600
V_{02}
i_{02}
604
606
602
A/D
CPU
D/A
R_{SG}

FIG. 43

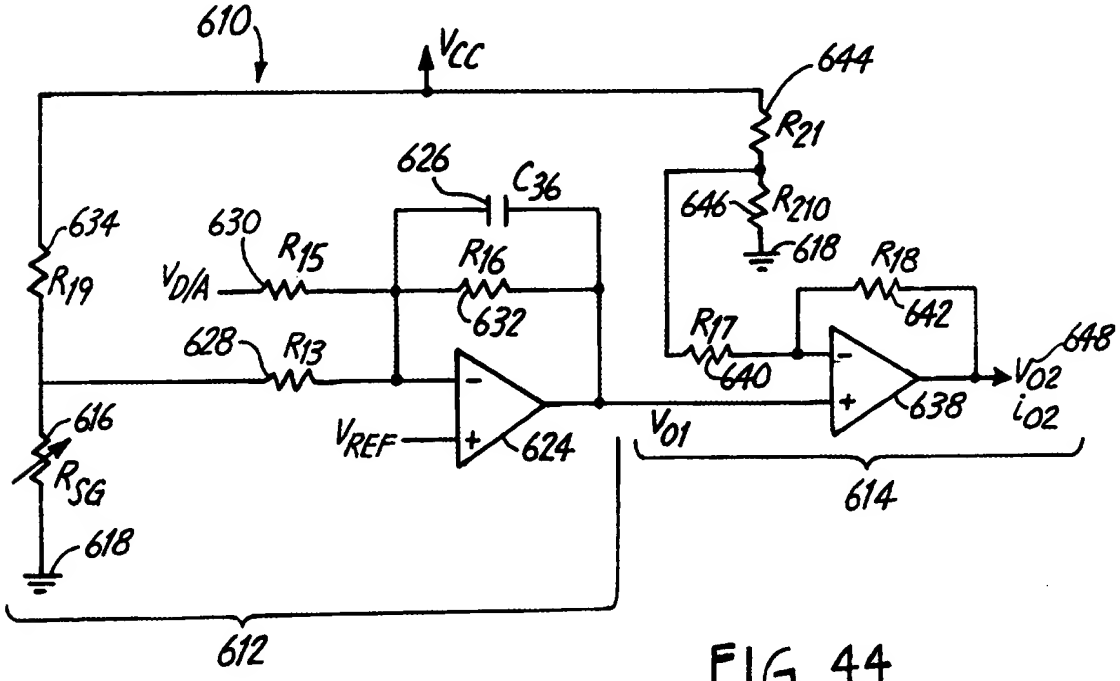

610
V_{CC}
644
R_{21}
626
C_{36}
646
R_{210}
618
R_{18}
642
634
R_{19}
630
R_{15}
$V_{D/A}$
R_{16}
632
R_{17}
640
648
V_{02}
i_{02}
628
R_{13}
638
616
R_{SG}
V_{REF}
624
V_{01}
614
618
612

FIG. 44

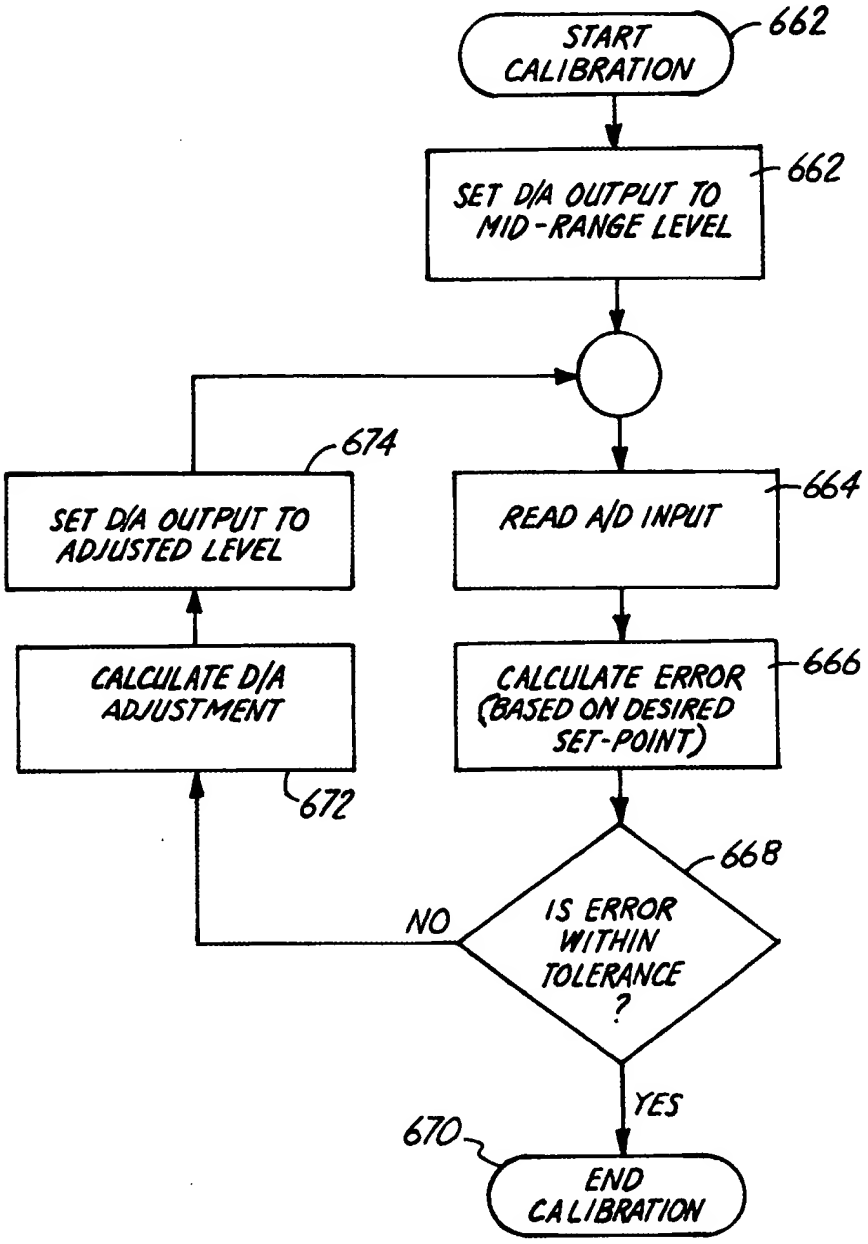

START CALIBRATION
662
SET D/A OUTPUT TO MID-RANGE LEVEL
662
674
SET D/A OUTPUT TO ADJUSTED LEVEL
READ A/D INPUT
664
CALCULATE D/A ADJUSTMENT
CALCULATE ERROR (BASED ON DESIRED SET-POINT)
666
672
668
NO
IS ERROR WITHIN TOLERANCE ?
YES
670
END CALIBRATION

FIG. 45

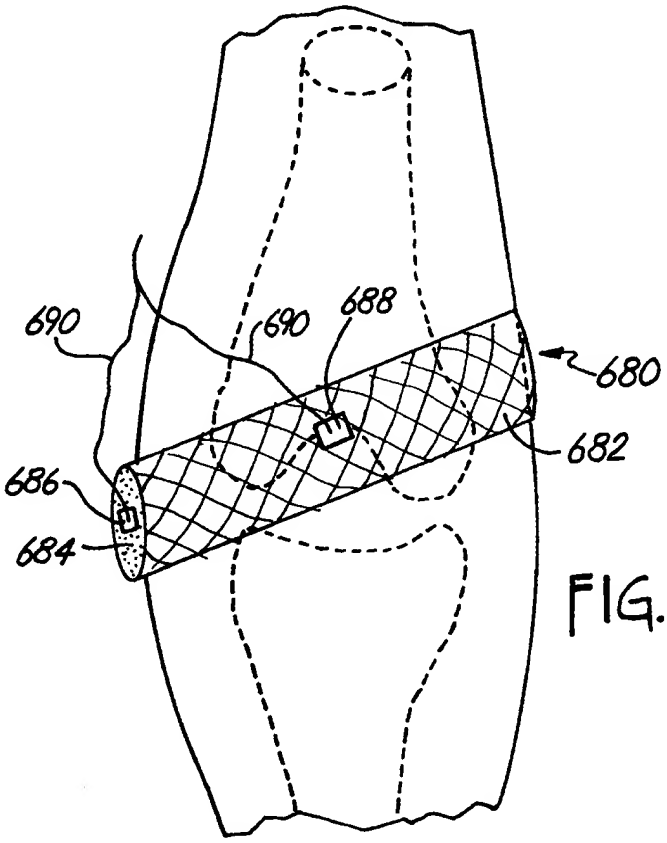
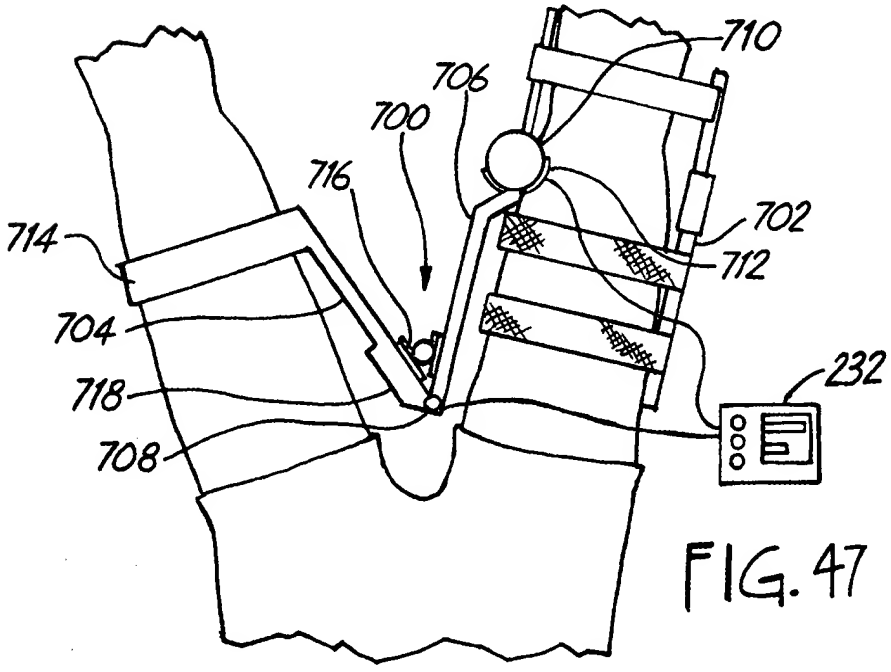

690
690
688
680
682
686
684

FIG. 46


710
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700
716
702
714
712
704
232
718
708

FIG. 47

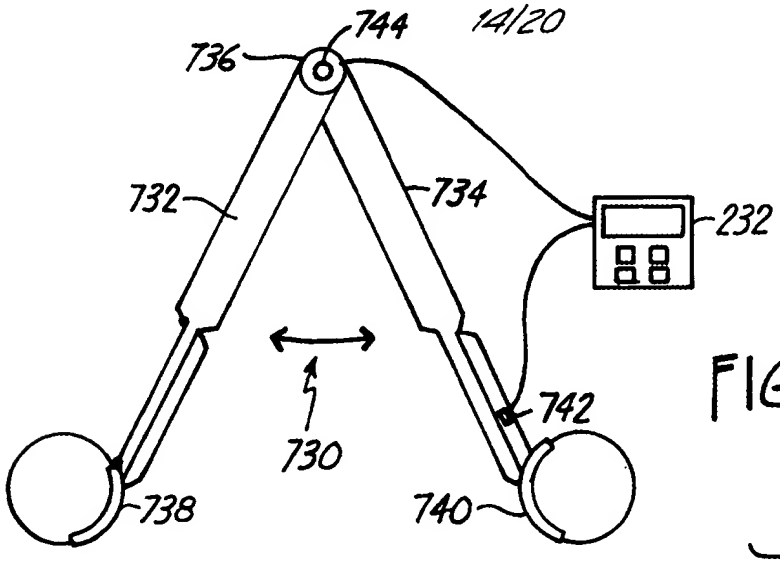

FIG. 48

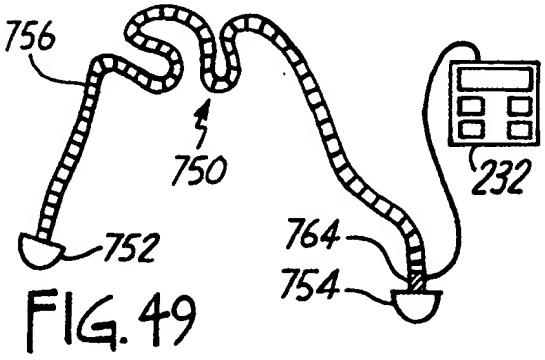

FIG. 49

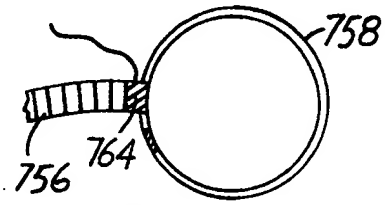

FIG. 50A

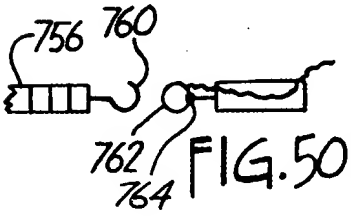

FIG. 50B

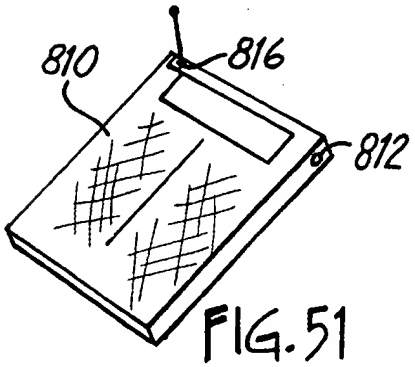

FIG. 51

FIG. 52

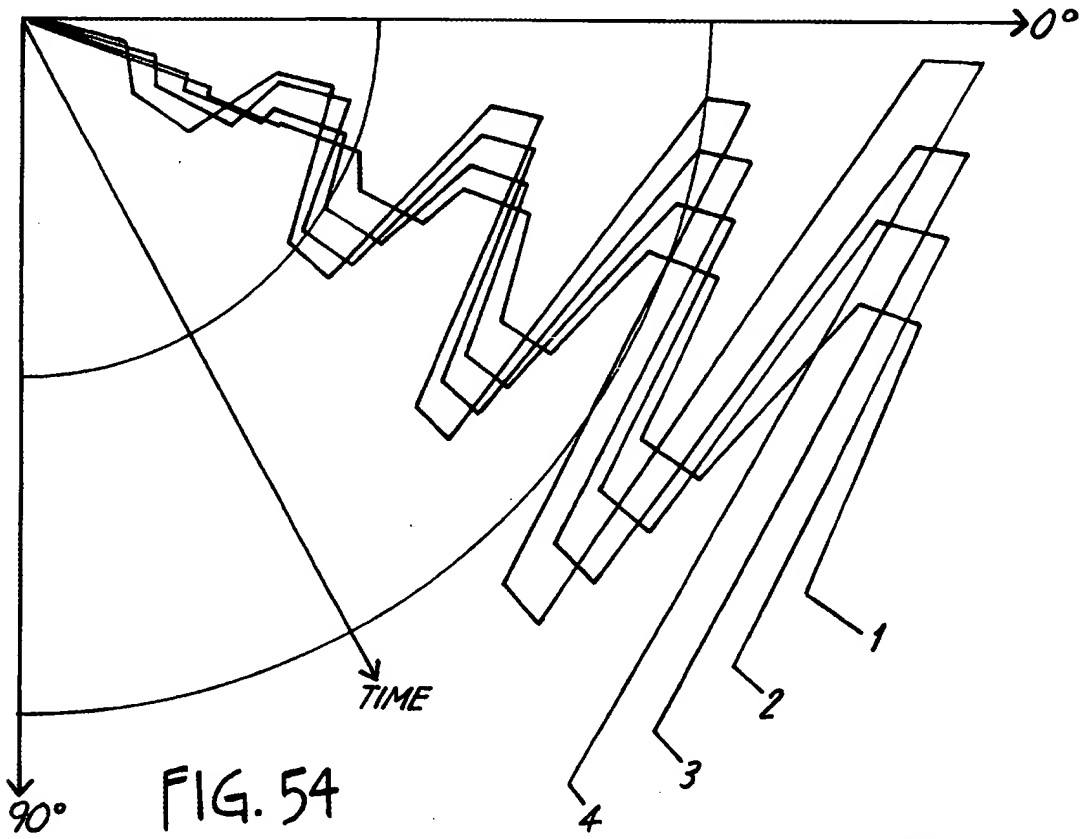

FIG. 54

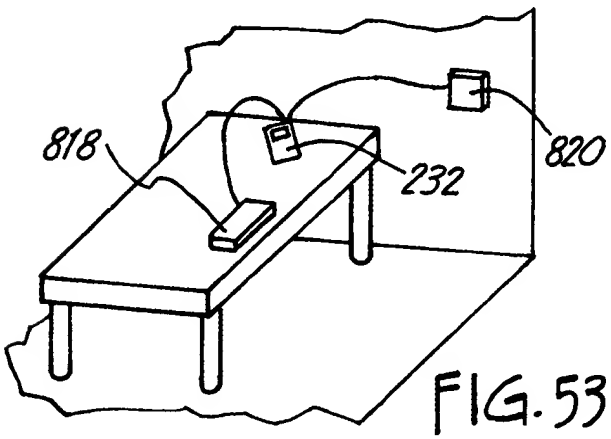

FIG. 53

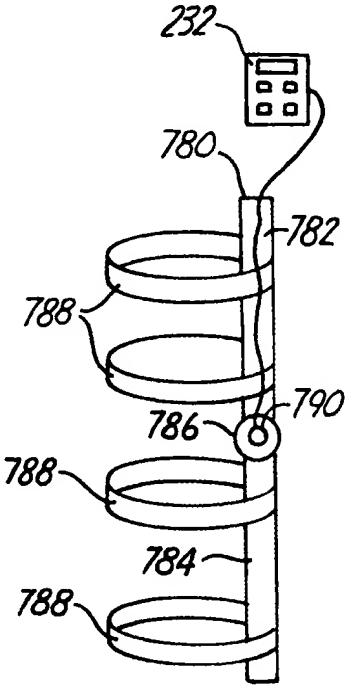

FIG. 55

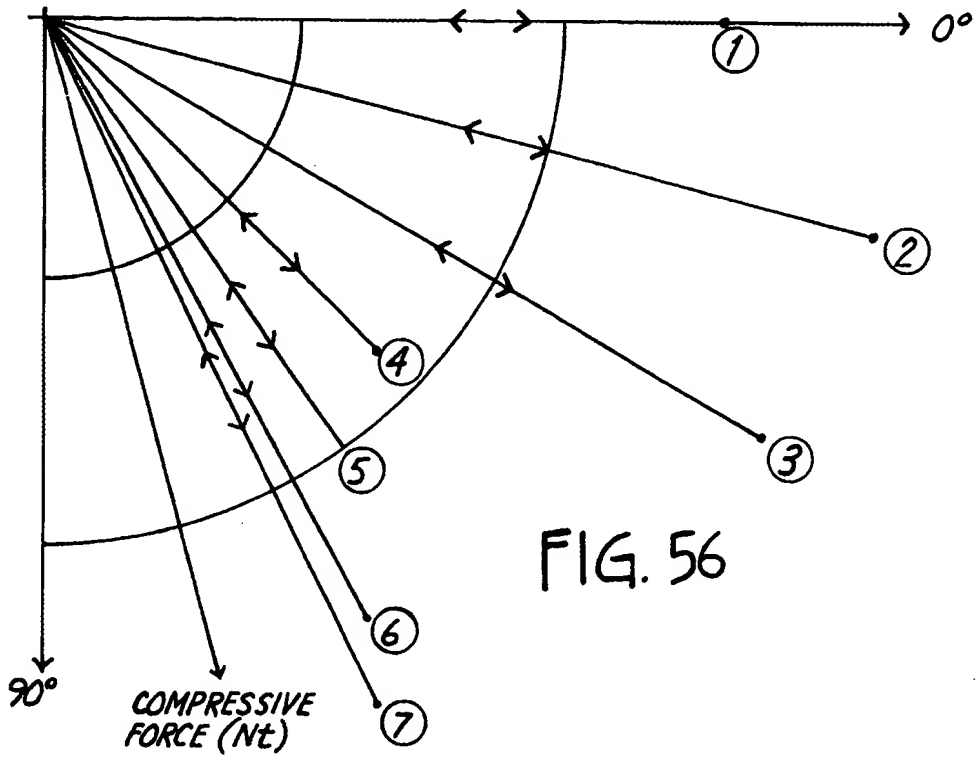

FIG. 56

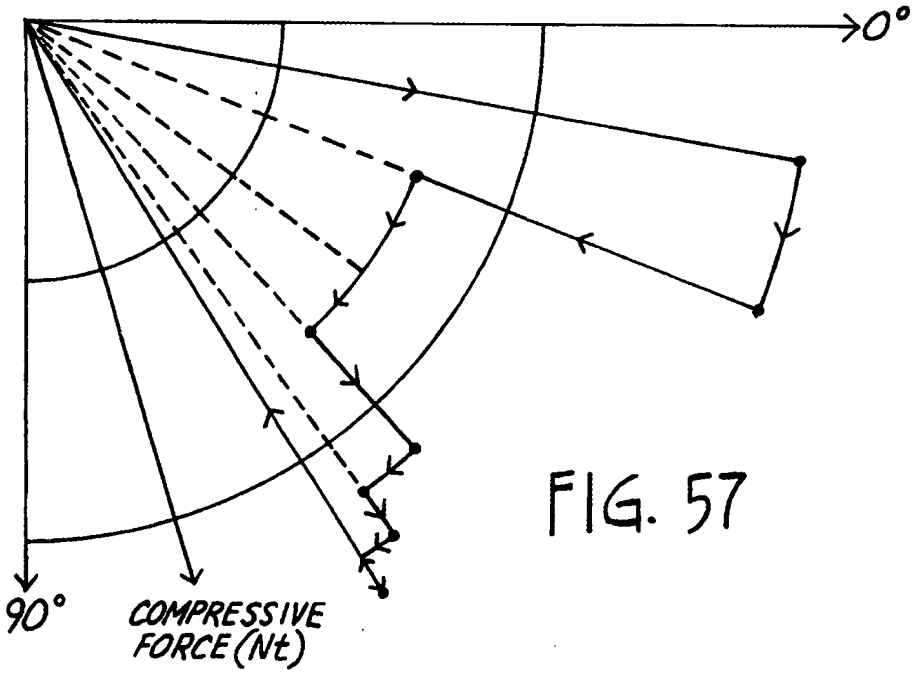

FIG. 57

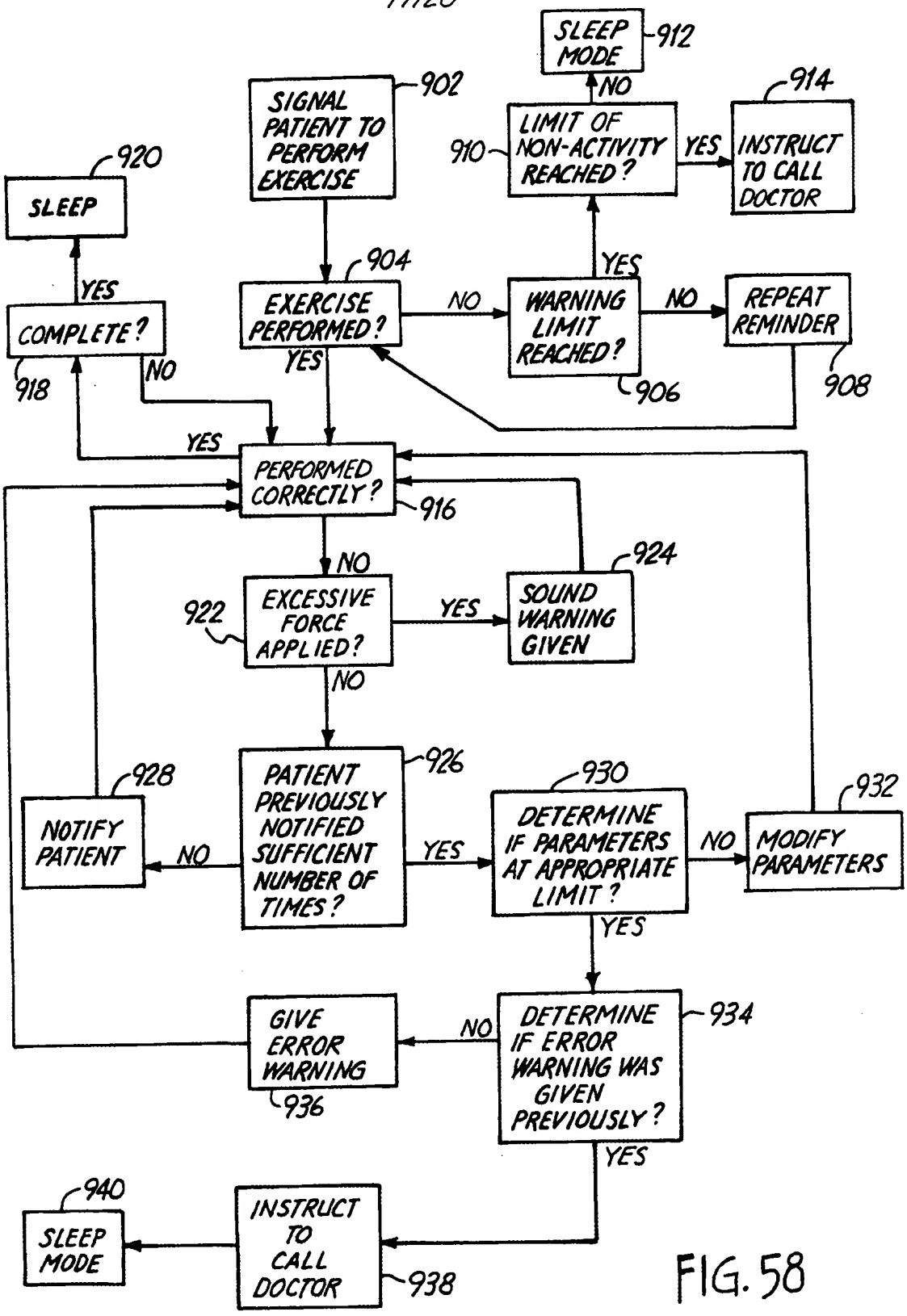
SLEEP MODE
912
NO
914
SIGNAL PATIENT TO PERFORM EXERCISE
902
LIMIT OF NON-ACTIVITY REACHED?
910
YES
INSTRUCT TO CALL DOCTOR
920
SLEEP
YES
904
EXERCISE PERFORMED?
NO
WARNING LIMIT REACHED?
NO
REPEAT REMINDER
COMPLETE?
918
NO
YES
906
908
YES
PERFORMED CORRECTLY?
916
NO
924
EXCESSIVE FORCE APPLIED?
922
YES
SOUND WARNING GIVEN
NO
928
926
930
932
NOTIFY PATIENT
NO
PATIENT PREVIOUSLY NOTIFIED SUFFICIENT NUMBER OF TIMES?
YES
DETERMINE IF PARAMETERS AT APPROPRIATE LIMIT?
NO
MODIFY PARAMETERS
YES
GIVE ERROR WARNING
NO
DETERMINE IF ERROR WARNING WAS GIVEN PREVIOUSLY?
934
936
YES
940
SLEEP MODE
INSTRUCT TO CALL DOCTOR
938

FIG. 58

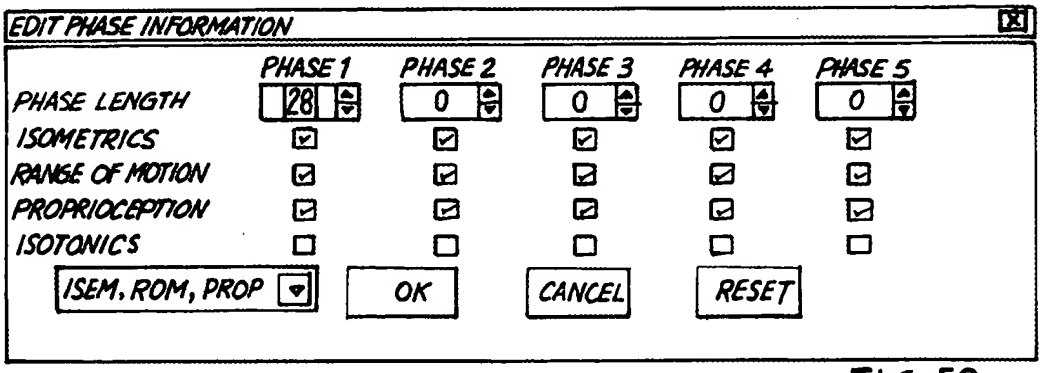

FIG. 59

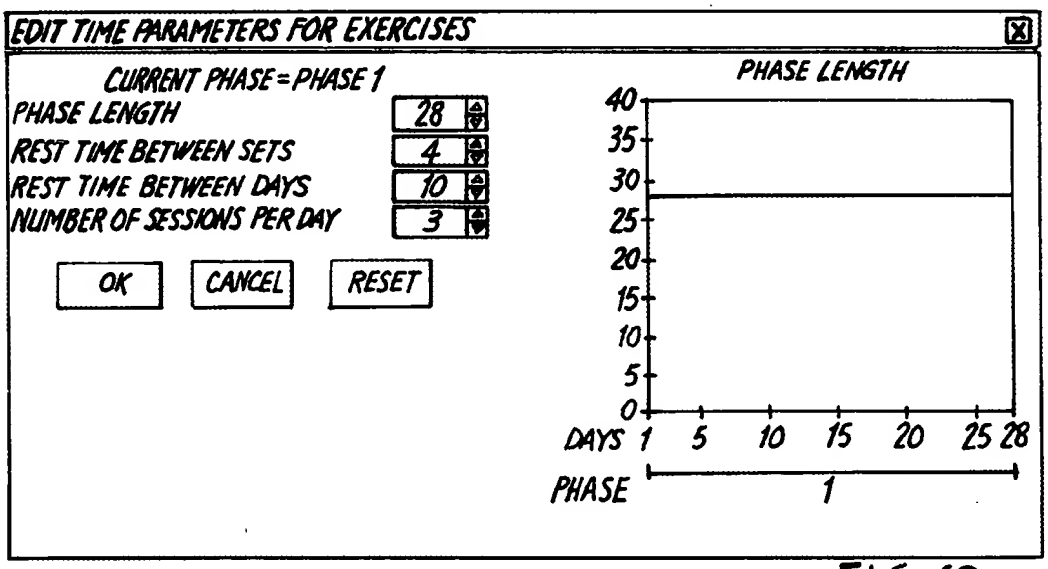

FIG. 60

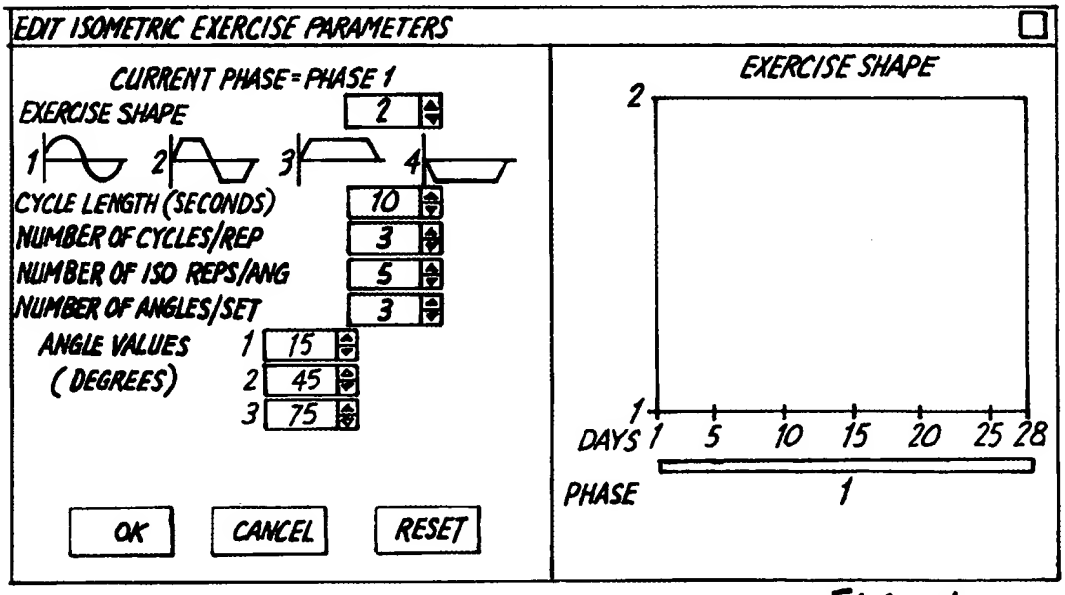

FIG. 61

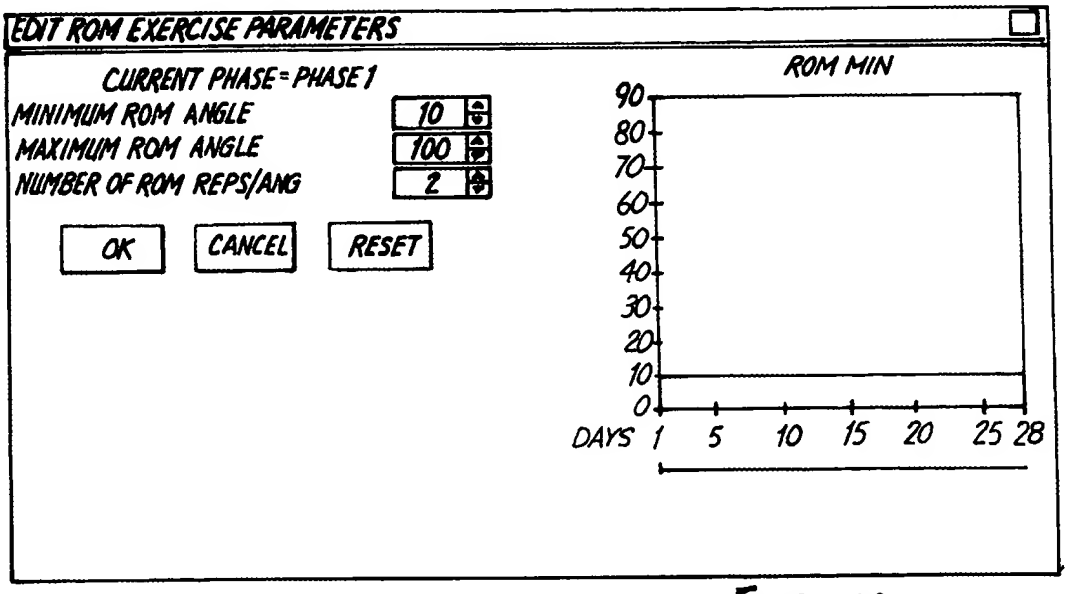
EDIT ROM EXERCISE PARAMETERS
CURRENT PHASE = PHASE 1
MINIMUM ROM ANGLE
10
MAXIMUM ROM ANGLE
100
NUMBER OF ROM REPS/ANG
2
OK
CANCEL
RESET
ROM MIN
90
80
70
60
50
40
30
20
10
0
DAYS 1 5 10 15 20 25 28

FIG. 62

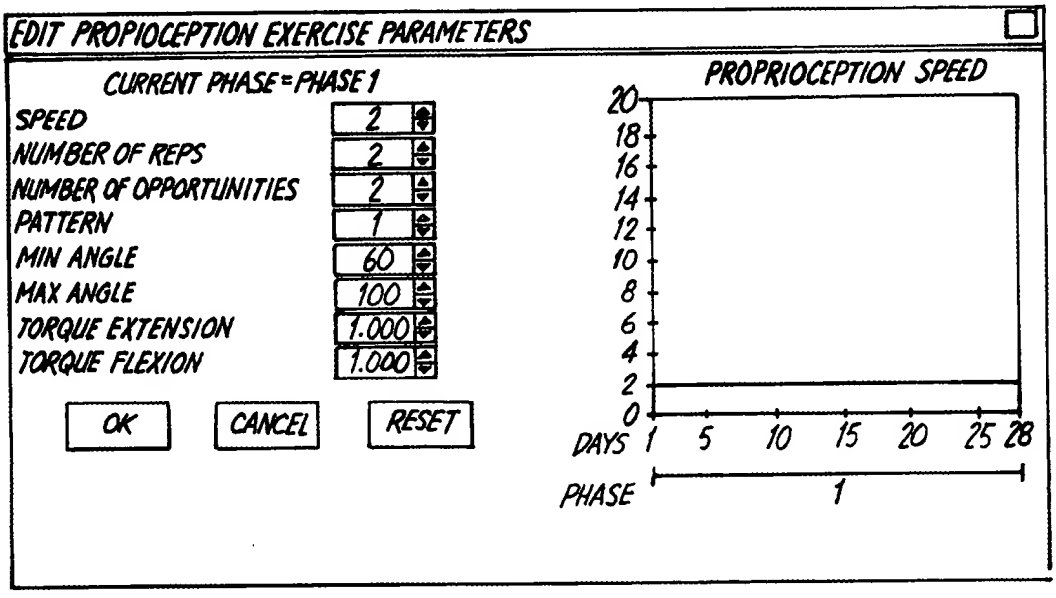
EDIT PROPIOCEPTION EXERCISE PARAMETERS
CURRENT PHASE = PHASE 1
SPEED
2
NUMBER OF REPS
2
NUMBER OF OPPORTUNITIES
2
PATTERN
1
MIN ANGLE
60
MAX ANGLE
100
TORQUE EXTENSION
1.000
TORQUE FLEXION
1.000
OK
CANCEL
RESET
PROPRIOCEPTION SPEED
20
18
16
14
12
10
8
6
4
2
0
DAYS 1 5 10 15 20 25 28
PHASE
1

FIG. 63

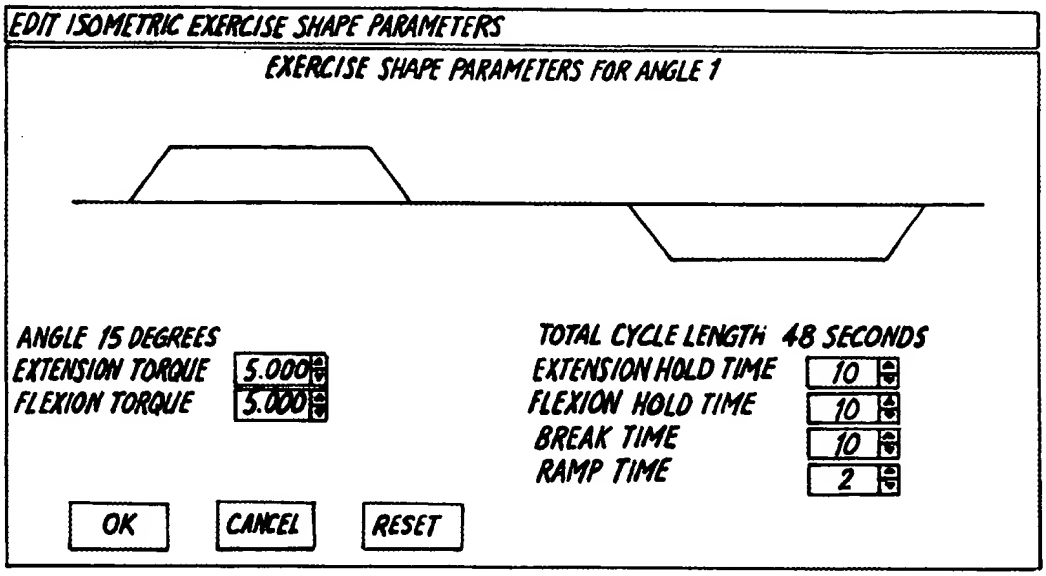

FIG. 64

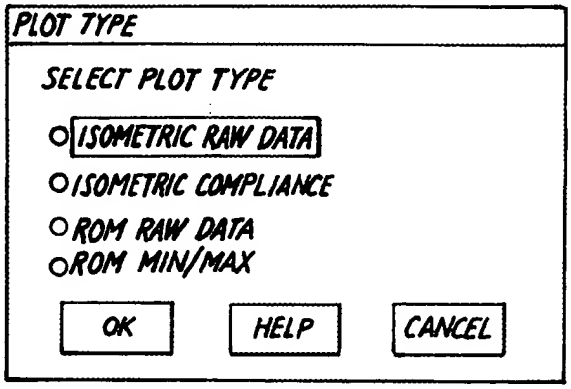

FIG. 65

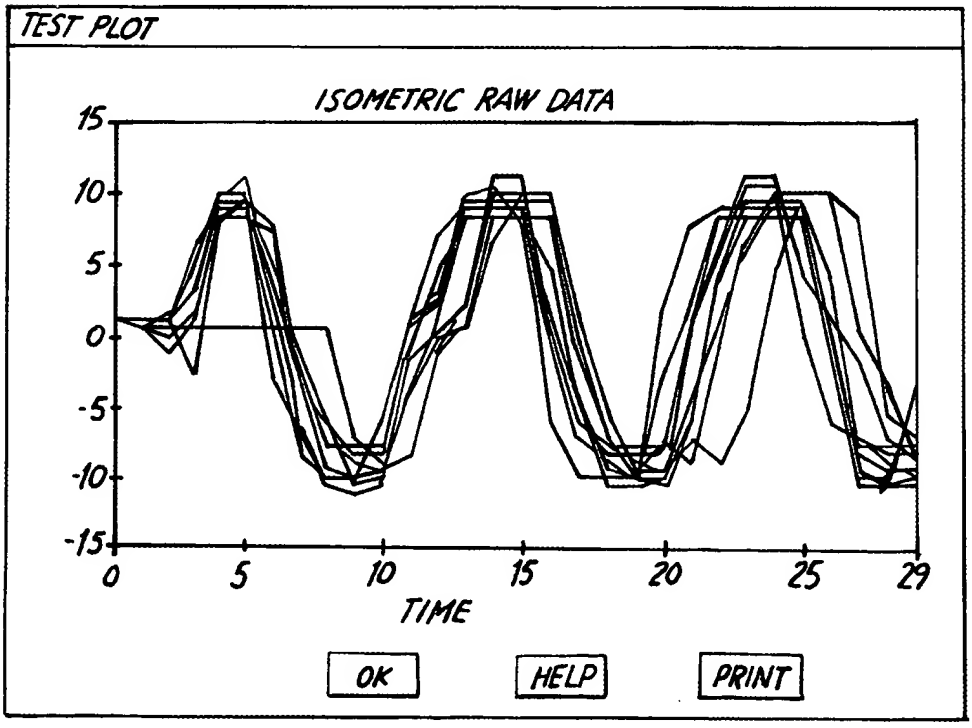

FIG. 66